

SUPPORT FOR THE AMENDMENT

This Amendment cancels Claim 4; and amends Claim 1. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claim 1 is found in canceled Claim 4 and in the specification at least in the examples. (As confirmed by the Final Rejection at page 2, section 2, lines 9-11, "[t]he instant specification does teach specific example, where the ferroelectric film is composed of a different material from the second perovskite oxide film".) No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 1-2 and 5-9 will be pending in this application. Claim 1 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

Applicants thank the Examiner for the courtesies extended to their representative during the May 10, 2004, personal interview.

As discussed at the interview, the present invention provides a multilayer thin film including a ferroelectric thin film having improved properties as a result of being epitaxially grown on a primer layer of a perovskite oxide thin film having a (100) or (001) orientation that is grown on a buffer layer on a silicon substrate. See, e.g., specification at page 4, lines 13-16 and 25-30; page 5, lines 18-19. The specification at Example 1 shows that ferroelectric PZT grown on a primer layer of the perovskite oxide PbTiO_3 that is grown on a buffer layer ($\text{Pt/Y}_2\text{O}_3/\text{ZrO}_2$) on Si has an electromechanical coupling factor of $k^2 = 39\%$, while PZT grown directly on the buffer layer on Si without the primer layer of PbTiO_3 has an

electromechanical coupling factor of only 33%, which is inferior to that obtained with the primer layer of PbTiO_3 . See, specification at page 24, lines 6-24.

Claims 1-2 and 4-8 are rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,801,105 ("Yano") in view of U.S. Patent No. 5,393,352 ("Summerfelt") or U.S. Patent No. 5,674,563 ("Tarui"). In addition, Claims 1-2 and 4-8 are rejected under 35 U.S.C. § 103(a) over JP 10-017394 ("Yano-394") (based on an English computer translation and an English abstract of Yano-394) in view of Summerfelt or Tarui. Claims 1-2 and 4-8 are rejected under 35 U.S.C. § 103(a) over Yano-394 (where U.S. Patent No. 6,121,647 is used as an accurate translation of Yano-394) in view of Summerfelt or Tarui. Claim 9 is rejected under 35 U.S.C. § 103(a) over Yano or Yano-394 (where U.S. Patent No. 6,121,647 is used as an accurate translation of Yano-394) or Yano-394 (based on an English computer translation and an English abstract of Yano-394) in view of Summerfelt or Tarui and further in view of U.S. Patent No. 5,744,374 ("Moon") or U.S. Patent No. 5,834,803 ("Nashimoto").

The cited prior art discloses multilayers of a ferroelectric film grown directly on a buffer layer of $\text{Pt/BaTiO}_3/\text{ZrO}_2$ on a Si substrate. In particular, Yano discloses a multilayer film of $\text{BaTiO}_3(001) / \text{Pt}(001) / \text{BaTiO}_3(001) / \text{ZrO}_2(001) / \text{Si}$. Yano at column 28, lines 54-55.

The Yano references fail to suggest the independent Claim 1 limitations of "a **second perovskite oxide thin film** formed on said buffer layer, where said second perovskite oxide thin film comprises PbTiO_3 and has a (100) or (001) orientation, **and a ferroelectric thin film**, which has a different composition than the second perovskite oxide thin film and which is epitaxially grown on said second perovskite oxide thin film". The Final Rejection agrees that the Yano references, "[do] not teach the ferroelectric film is not the second perovskite oxide thin film, that is grown on the second perovskite thin film". Final Rejection at page 4, lines 3-4; page 6, lines 6-7; page 7, lines 18-19.

Summerfelt discloses a Pb and/or Bi-containing high dielectric constant oxide (e.g. ferroelectric PZT) epitaxially grown on a perovskite buffer layer of **Pb** and Bi **free**, high-dielectric constant oxide grown on a metal layer deposited on a silicon substrate. Summerfelt at Claims 20-21, 28, 31.

However, Summerfelt teaches away from and fails to suggest the independent Claim 1 limitations of a second perovskite layer that has a (100) or (001) orientation and that is between the recited ferroelectric thin film and buffer layer wherein the "second perovskite oxide thin film comprises PbTiO₃", which is **not free** of **Pb**.

Thus, the combination of Summerfelt with Yano fails to suggest all the limitations of independent Claim 1.

Tarui discloses forming a PZT ferroelectric thin film on a PbTiO₃ buffer layer by depositing in oxygen an ordered sequence of layers of Ti or TiO₂; Pb or PbO; and Zr or ZrO₂, and heating the sequence of layers. Tarui at, e.g., column 5, lines 35-67; column 16, lines 37-53.

However, Tarui is silent about the orientation of the PbTiO₃ and about growing the PZT ferroelectric thin film epitaxially on the PbTiO₃. Yano in view of Tarui fails to suggest the independent Claim 1 features of a ferroelectric thin film **epitaxially grown on** a second perovskite oxide thin film that comprises PbTiO₃ and has a (100) or (001) orientation.

Thus, the combination of Tarui with Yano fails to suggest all the limitations of independent Claim 1.

Because the cited prior art fails to suggest all the limitations of independent Claim 1, the prior art rejections should be withdrawn.

Claim 1 is rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement. To obviate the rejection, Claim 1 is amended to recite that the ferroelectric film "has a different composition than the second perovskite oxide thin

film". As discussed above, the Final Rejection admits at page 2, section 2, lines 9-11, that "[t]he instant specification does teach specific example, where the ferroelectric film is composed of a different material from the second perovskite oxide film". Thus, the rejection under 35 U.S.C. § 112, first paragraph, should be withdrawn.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.


Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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